

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 27 September 2000 (27.09.00)	
International application No. PCT/SE00/00163	Applicant's or agent's file reference TP 1299 WO
International filing date (day/month/year) 27 January 2000 (27.01.00)	Priority date (day/month/year) 01 February 1999 (01.02.99)
Applicant HEINONEN, Esko et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
07 July 2000 (07.07.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Claudio Borton
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference TP 1299 WO	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/SE 00/00163	International filing date (<i>day/month/year</i>) 27 January 2000	(Earliest) Priority Date (<i>day/month/year</i>) 1 February 1999
Applicant Tetra Laval Holdings & Finance SA et al		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (See Box I).

2. ☐ Unity of invention is lacking (See Box II).

3. ☐ The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing

☐ filed with the international application.
☐ furnished by the applicant separately from the international application,

☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

☐ transcribed by this Authority.

4. With regard to the title, ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.
☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is:
 Figure No. 3

☐ as suggested by the applicant. ☐ None of the figures.
☐ because the applicant failed to suggest a figure.
☒ because this figure better characterizes the invention.

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PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



14

Applicant's or agent's file reference TP 1299-WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/SE00/00163	International filing date (day/month/year) 27.01.2000	Priority date (day/month/year) 01.02.1999
International Patent Classification (IPC) or national classification and IPC ₇ B 65 B 7/20, B 65 B 3/02		
Applicant Tetra Laval Holdings & Finance SA ET AL		

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NOV 06 2001

TC 1700

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

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NOV 06 2001
TC 1700

Date of submission of the demand 07.07.2000	Date of completion of this report 05.06.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer Anette Hall/Els Telephone No. 08-782 25 00

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE00/00163

I. Basis of the report

1. With regard to the elements of the international application:*

- ☒ the international application as originally filed
- ☐ the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the drawings:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language English which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☒ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE00/00163

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims	<u>4-10</u>	YES
	Claims	<u>1-3</u>	NO
Inventive step (IS)	Claims	<u>4-6, 9, 10</u>	YES
	Claims	<u>1-3, 7, 8</u>	NO
Industrial applicability (IA)	Claims	<u>1-10</u>	YES
	Claims	<u></u>	NO

2. Citations and explanations (Rule 70.7)

The claimed invention relates to a method and an apparatus for forming and thermosealing one end of a packaging container. The method comprises the steps of conveying the containers, bringing a mouth of the container to a flattened position, to heat the thermoplastic material located on the sealing fins and to seal together flattened walls. The apparatus includes a conveyor, forming means to flatten a mouth of the container, heating means to heat the thermoplastic material located on the sealing fins and a compressing means to bring the heated wall means together.

Document US, 2979995, A discloses an apparatus and a method for closing and sealing liquid containers. A conveyor continuously displaces the containers through a forming station in contact with mechanical forming means (16, 17). A pair of heating elements (26, 27) heats the container's liner and a pair of pressure wheels (28, 29) seals together the walls of the liner.

The document discloses a method identical to the one described in claims 1 and 2 and also a device identical to the one described in claim 3.

.../...

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE00/00163

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V

Document SE, 390716, C discloses a container fabricating machine having a forming mechanism for erecting and bottom sealing paperboard container blanks and a filling mechanism for filling and top-sealing the bottom formed containers. The filling mechanism includes a feeding mechanism that receives the containers from the transfer mechanism and grips all four corners of the bottom formed containers while advancing them through the filling mechanism's filling and sealing operations and that is readily adjustable to accommodate containers of various base sizes without disturbing the machine's overall synchronisation. Heating means heats the container's liner and a pair of pressure means seals together the walls of the liner.

The document discloses a method identical to the one described in claims 1 and a device identical to the one described in claim 3.

Consequently, the subject matter of claims 1-3 lack novelty.

To use conductor means to heat a laminate is obvious to one skilled in the art.

Consequently, the subject matter of claims 7 and 8 lack inventive step.

The subject matter of claims 1-10 fulfils the requirement of industrial applicability.

Document US, 3120089, A discloses an apparatus and a method for closing and sealing containers. A conveyor displaces the containers through a forming station in contact with mechanical forming means. A pair of heating elements heats the container's liner and a pair of pressure means seals together the walls of the liner.

.../...

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE00/00163

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V

Document US, 4473989, A discloses a method for sealing and filling pouches. The process which comprises expanding each pouch, dropping them into a holding hole of a pouch supporting base, a filling up operation process a fixed quantity of substances are injected in pouches as soon as a push-up plate of the pouch supporting base contacts and pushes up the lower end of filling up nozzle cover in the filling up operation station. A seal operation process comprises sealing the filling mouth portion of the filled pouches with a heat sealer and a collecting operation process separates hermetically sealed pouches from the holding holes of the pouch support base using lifting belts.

Document US, 3861123, A discloses an apparatus for automatically creasing and folding the open ends of filled bags. It includes opposed gripping belts for moving the bags linearly and continuously through creasing and trimming stations at which rollers form two creases in and trim the sheet material of the end section of each bag and then through two folding stations each of which folds the end section upon itself about one of the creases. The shafts for rotary and axial motion are mounted in a plane parallel with that of the guide surfaces.

These devices are not considered to be of particular relevance to the present claimed invention.

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ _____

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:

The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only	
Identification of IPEA	Date of receipt of DEMAND
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION	
Applicant's or agent's file reference TP 1299-WO	
International application No. PCT/SE00/00163	International filing date (day/month/year) 27-01-2000
(Earliest) Priority date (day/month/year) 01-02-1999	
Title of invention A METHOD AND AN APPARATUS FOR FORMING AND THERMOSEALING PACKAGING CONTAINERS	
Box No. II APPLICANT(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	
TETRA LAVAL HOLDINGS & FINANCE SA Avenue Général-Guisan 70 CH-1009 PULLY Switzerland	
Telephone No.: + 41 21 729 2211	
Facsimile No.: + 41 21 729 2759	
Teleprinter No.: 21 455811	
State (that is, country) of nationality: CH	State (that is, country) of residence: Switzerland
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	
HEINONEN, Esko Pråmvägen 11 S-241 93 ESLÖV Sweden	
State (that is, country) of nationality: SE	State (that is, country) of residence: Sweden
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	
NYHLÉN, Mats Sofiaparken 4F S-222 41 LUND Sweden	
State (that is, country) of nationality: SE	State (that is, country) of residence: Sweden
<input checked="" type="checkbox"/> Further applicants are indicated on a continuation sheet.	

Sheet No. 2

International application No.
PCT/SE00/00163

Continuation of Box No. II APPLICANT(S)

If none of the following sub-boxes is used, this sheet should not be included in the demand.

Name and address: *(Family name followed by given name: for a legal entity: full official designation. The address must include postal code and name of country.)*

ANDERSSON, Mikael
Vierydsvägen 158
S-372 91 RONNEBY
Sweden

State *(that is, country)* of nationality:

SE

State *(that is, country)* of residence:

Sweden

Name and address: *(Family name followed by given name: for a legal entity: full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

Name and address: *(Family name followed by given name: for a legal entity: full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

Name and address: *(Family name followed by given name: for a legal entity: full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

☐ Further applicants are indicated on another continuation sheet.

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCEThe following person is ☒ agent ☐ common representativeand ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*BENTZ, Christer
AB TETRA PAK
Ruben Rausings gata
S-221 86 LUND Sweden

Telephone No.:

+ 46 46 361448

Facsimile No.:

+ 46 46 137923

Teleprinter No.:

32140 TP LUNDS

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.**Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION****Statement concerning amendments:***

1. The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filed

the description

☐ as originally filed☐ as amended under Article 34

the claims

☐ as originally filed☐ as amended under Article 19 (together with any accompanying statement)☐ as amended under Article 34

the drawings

☐ as originally filed☐ as amended under Article 342. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English

☒ which is the language in which the international application was filed.☐ which is the language of a translation furnished for the purposes of international search.☐ which is the language of publication of the international application.☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.**Box No. V ELECTION OF STATES**The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- | | | |
|--|---|--------|
| 1. translation of international application | : | sheets |
| 2. amendments under Article 34 | : | sheets |
| 3. copy (or, where required, translation) of amendments under Article 19 | : | sheets |
| 4. copy (or, where required, translation) of statement under Article 19 | : | sheets |
| 5. letter | : | sheets |
| 6. other (<i>specify</i>) | : | sheets |

For International Preliminary Examining Authority use only

received not received

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

The demand is also accompanied by the item(s) marked below:

- | | |
|--|---|
| 1. <input checked="" type="checkbox"/> fee calculation sheet | 4. <input type="checkbox"/> statement explaining lack of signature |
| 2. <input type="checkbox"/> separate signed power of attorney | 5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in computer readable form |
| 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: | 6. <input type="checkbox"/> other (<i>specify</i>): |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

TETRA LAVAL HOLDINGS & FINANCE SA

Christer Bentz

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):

3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply.

☐ The applicant has been informed accordingly.

4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.

5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

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Demand received from IPEA on:

PCT

CHAPTER II

FEE CALCULATION SHEET

Annex to the Demand for international preliminary examination

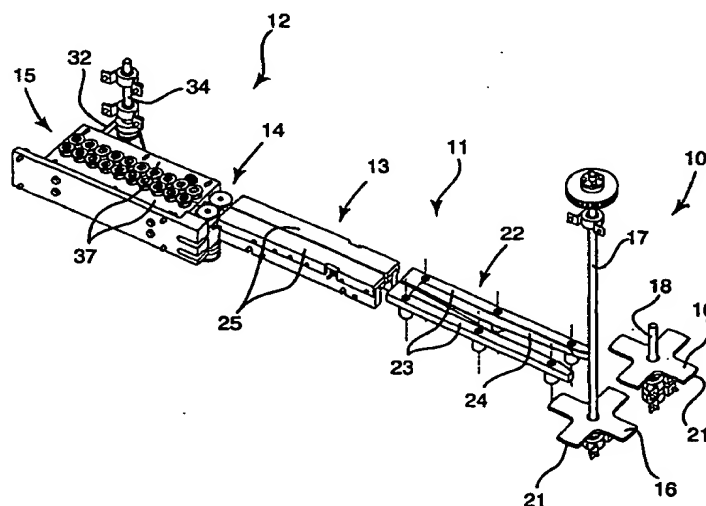
International application No. PCT/SE00/00163	For International Preliminary Examining Authority use only
Applicant's or agent's file reference TP 1299-WO	Date stamp of the IPEA
Applicant <div style="text-align: center; font-weight: bold;">TETRA LAVAL HOLDINGS & FINANCE SA</div>	
Calculation of prescribed fees <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> 1. Preliminary examination fee </div> <div style="width: 35%; text-align: right;"> <div style="border: 1px solid black; padding: 2px;">4.200:-</div> <div style="border: 1px solid black; padding: 2px; width: 20px; text-align: center;">P</div> </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 60%;"> 2. Handling fee <i>(Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.)</i> </div> <div style="width: 35%; text-align: right;"> <div style="border: 1px solid black; padding: 2px;">1.270:-</div> <div style="border: 1px solid black; padding: 2px; width: 20px; text-align: center;">H</div> </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 60%;"> 3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box..... </div> <div style="width: 35%; text-align: right;"> <div style="border: 1px solid black; padding: 2px;">SEK 5.470:-</div> <div style="border: 1px solid black; padding: 2px; width: 100px; text-align: center;">TOTAL</div> </div> </div>	
Mode of Payment <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input checked="" type="checkbox"/> authorization to charge deposit account with the IPEA (see below) </div> <div style="width: 45%;"> <input type="checkbox"/> cash </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 45%;"> <input type="checkbox"/> cheque </div> <div style="width: 45%;"> <input type="checkbox"/> revenue stamps </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 45%;"> <input type="checkbox"/> postal money order </div> <div style="width: 45%;"> <input type="checkbox"/> coupons </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 45%;"> <input type="checkbox"/> bank draft </div> <div style="width: 45%;"> <input type="checkbox"/> other (specify): </div> </div>	
Deposit Account Authorization <i>(this mode of payment may not be available at all IPEAs)</i> The IPEA/ <u>SE</u> <input checked="" type="checkbox"/> is hereby authorized to charge the total fees indicated above to my deposit account. <input type="checkbox"/> <i>(this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit)</i> is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.	
<u>164020</u> Deposit Account Number	<u>06-07-2000</u> Date (day/month/year)
<div style="text-align: right;"> Signature Christer Bentz </div>	



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : B65B 7/20, 3/02	A1	(11) International Publication Number: WO 00/44619 (43) International Publication Date: 3 August 2000 (03.08.00)
(21) International Application Number: PCT/SE00/00163 (22) International Filing Date: 27 January 2000 (27.01.00) (30) Priority Data: 9900330-3 1 February 1999 (01.02.99) SE (71) Applicant (for all designated States except US): TETRA LAVAL HOLDINGS & FINANCE SA [CH/CH]; Avenue Général-Guisan 70, CH-1009 Pully (CH). (72) Inventors; and (75) Inventors/Applicants (for US only): HEINONEN, Esko [SE/SE]; Pråmvägen 11, S-241 93 Eslöv (SE). NYHLÉN, Mats [SE/SE]; Sofiaparken 4F, S-222 41 Lund (SE). ANDERSSON, Mikael [SE/SE]; Vierydsvägen 158, S-372 91 Ronneby (SE). (74) Agent: BENTZ, Christer; AB Tetra Pak, Patent Department, Ruben Rausing Gata, S-221 86 Lund (SE).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>

(54) Title: A METHOD AND AN APPARATUS FOR FORMING AND THERMOSEALING PACKAGING CONTAINERS

**(57) Abstract**

The disclosure relates to a method and an apparatus for forming and thermosealing one end of a packaging container which is manufactured from thermosealable material. The packaging container is placed in a conveyor which brings it into contact with mechanical forming devices (22) which progressively reform the packaging container end so that a sealing fin (6) oriented in the direction of movement of the packaging container is formed. In a subsequent sealing station (12), thermoplastic material located in the sealing fin (6) is heated to sealing temperature, whereafter wall portions included in the sealing fin are mechanically urged against one another during simultaneous cooling and continued advancement.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav	TM	Turkmenistan
BF	Burkina Faso	GR	Greece		Republic of Macedonia	TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's	NZ	New Zealand		
CM	Cameroon		Republic of Korea	PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakhstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

A METHOD AND AN APPARATUS FOR FORMING AND THERMOSEALING PACKAGING CONTAINERS

TECHNICAL FIELD

5 The present invention relates to a method for forming and thermosealing one end of a packaging container comprising layers of thermosealable material, the packaging container being displaced by means of a conveyor through a forming station and a sealing station.

10 The present invention also relates to an apparatus for forming and thermosealing one end of a packaging container which is displaced by means of a conveyor through a forming station and a sealing station.

BACKGROUND ART

15 Consumer packages for liquid contents such as milk or juice have long been known in the art and occur in numerous different types and sizes. The packaging containers are normally manufactured from a laminated material which comprises layers of fibrous material, e.g. paper, as well as layers of thermoplastic which not only render the packaging laminate liquid-tight but also make for thermosealing thereof. The laminate may also include
20 additional layers, for example layers of gas barrier material such as aluminium foil (Alifoil) for further improving the properties of the laminate in protecting and keeping the product packed in the packaging container in pristine condition.

25 In a common type of packing and filling machine which is described in European Patent 217.282, a semi-manufacture is utilised in the form of tubular, flat-laid packaging container blanks. The blanks are provided in a per se known manner with a longitudinal seal as well as a pattern of crease lines in order to make for reforming of both ends of the blank into an end portion (top and bottom portion, respectively). Normally, the prefabricated,
30 flat-laid blank is raised so that it obtains a square or rectangular cross-sectional configuration, whereafter it is provided, by folding and sealing of end wall panels located at the one end of the blank and defined by means of crease lines, with a liquid-tight bottom. With the aid of a conveyor, the blank provided with a bottom is thereafter displaced to a filling station in which it
35 is supplied with the desired quantity of suitable contents, e.g. milk. After completed filling, the thus filled blank is displaced an additional step to a

subsequent sealing station in which the upper end of the blank (after possible additional forming) is sealed together in a liquid-tight transverse seal. In the forming operation, triangular corner flaps occur for reasons of geometry, and the flaps may be folded outwards or inwards and fixed in place in a suitable manner.

The above-described procedure takes place in conventional machines, normally as an intermittent process, i.e. the conveyor stepwise displaces the different packaging containers between the stations for bottom forming/sealing, filling and top forming/sealing. Since each packaging container, in the instant of processing, is located in a stationary, accurately fixed position, processing and sealing may take place with the aid of intermittently operating, reciprocating processing tools. Normally, conventional sealing jaws are employed in this connection for thermosealing, the jaws reciprocating in a direction substantially transversely in relation to the direction of movement of the conveyor. In certain types of machines, preforming of the ends of the packaging container blank takes place partly during the movement of the conveyor up to the sealing stations, e.g. with the aid of rotary or fixed forming devices. For example, use is occasionally made of guides converging seen in the direction of movement of the conveyor in order to urge the end wall panels subsequently forming the end wall of the blank in a direction towards one another as a preparatory step to the actual final forming and sealing.

The striving to produce packing or filling machines operating at high output capacity has entailed increasingly faster conveyor speeds and shorter stay-times in the different processing stations. However, in stepwise advancement of the conveyor, a limit is soon reached at which the contents, in particular if they are of low viscosity such as, for example, milk or juice, begin to slosh out of the packaging containers in connection with the jerking stepwise advancement movement. Attempts to adapt the acceleration and retardation speeds of the conveyor to meet the viscosity of the contents have entailed certain improvements, but in order to ensure a further increased machine capacity, it is necessary to depart from the intermittent conveyor movement and provide the machine with a continuously operating conveyor running at constant speed. This in turn renders impossible the employment of stationary processing tools which reciprocate transversely in relation to the conveyor. As a result, there is a general need in the art to realise a

method of forming and thermosealing packaging containers in continuously moving containers, regardless of whether these are moved at varying or constant speed.

5 OBJECTS OF THE INVENTION - THE METHOD

One object of the present invention is to realise a method of forming and thermosealing one end of a packaging container while the packaging container is fed, without stopping, through a processing station, e.g. a station for forming or sealing of the end portion of the packaging container.

10 A further object of the present invention is to realise a method of forming and thermosealing one end of a packaging container, the method being suitable for use in continuous advancement of packaging containers in relation to fixed processing stations.

15 Yet a further object of the present invention is to realise a method of forming and thermosealing one end of a packaging container, the method making for considerably increased production speed as compared with prior art methods.

20 Still a further object of the present invention is finally to realise a method of forming and thermosealing one end of a packaging container, the method not suffering from the limitations and drawbacks inherent in prior art, similar methods.

SOLUTION

25 These and other objects have been attained according to the present invention in that the method described by way of introduction has been given the characterizing features that the conveyor displaces the packaging container through the forming station in contact with mechanical forming devices which progressively reform the packaging container end until such time as opposing walls thereof meet one another in a sealing fin oriented in
30 the direction of movement of the packaging container, whereafter the conveyor further displaces the packaging container end in between sealing devices disposed in the sealing station which heat thermoplastic material located in the sealing fin to sealing temperature, whereafter wall portions included in the sealing fin are mechanically urged against one another
35 during simultaneous cooling and continued advancement.

A preferred embodiment of the method according to the present invention has further been given the characterizing features as set forth in appended subclaim 2.

5 There is also a need in the art to realise a machine for the continuous part production of packaging containers in accordance with the above-disclosed method, i.e. a machine in which a continuously running conveyor displaces packaging containers through sequentially disposed processing stations, e.g. stations for forming and thermosealing of an end portion of a packaging container.

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OBJECTS OF THE INVENTION - THE APPARATUS

One object of the present invention is to realise an apparatus for forming and thermosealing one end of a packaging container which continuously moves through stations for forming and sealing.

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A further object of the present invention is to realise an apparatus for forming and thermosealing one end of a packaging container, the apparatus making it possible to process continuously moving packaging container blanks, i.e. packaging container blanks advanced by means of a conveyor.

20 Yet a further object of the present invention is to realise an apparatus for forming and thermosealing one end of a packaging container, the apparatus including stationary forming and sealing devices.

Still a further object of the present invention is to realise an apparatus for forming and thermosealing one end of a packaging container, the apparatus lacking intermittently moving parts.

25

Yet a further object of the present invention is finally to realise an apparatus for forming and thermosealing one end of a packaging container, the apparatus - despite simple and economical design and construction - making for a packaging or filling machine with considerably increased capacity compared with prior art, intermittently operating machines.

30

SOLUTION

The above and other objects have been attained according to the present invention in that an apparatus of the type described by way of introduction has been given the characterizing features that the forming
35 station includes a mechanical forming device which is disposed along the conveyor a distance therefrom, as well as sealing devices disposed in the

sealing station, the sealing devices similarly extending along the conveyor a distance therefrom and being disposed to heat a sealing region of the packaging container, and also compression devices disposed after the sealing devices and disposed to mechanically compress the heated wall portions so that these, after cooling, are sealed to one another in liquid-tight fashion.

Preferred embodiments of the apparatus according to the present invention have further been given the characterizing features as set forth in appended subclaims 4 to 10.

10 ADVANTAGES

The method and the apparatus according to the present invention thus make possible, through their continuous operational mode, a packing and filling machine with a continuously running packaging conveyor, which entails not only a considerably higher output capacity but also smoother operation and reduced wear compared with packing and filling machines of prior art type in which both the packaging conveyor and the processing tools move intermittently.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

One preferred embodiment of both the method and the apparatus according to the present invention will now be described in greater detail hereinbelow, with particular reference to the accompanying, schematic Drawings which show only those parts and details essential to an understanding of the present invention. In the accompanying Drawings:

Fig. 1 is a schematic perspective view of an upper portion of a per se known packaging container during forming and sealing in accordance with the method according to the present invention;

Fig. 2 is a perspective view of the apparatus according to the present invention;

Fig. 3 shows parts of the apparatus of Fig. 2 in another perspective;

Figs. 4 A-E show mutually subsequent cross sections through folding rails in the apparatus according to the present invention;

Fig. 5 is a cross section through parts of inductors in the apparatus according to the present invention;

Fig. 6 shows, in perspective and on a larger scale, a part of the sealing station according to the present invention; and

Fig. 7 shows, on a larger scale, a part of two compression rollers according to the present invention.

DESCRIPTION OF PREFERRED EMBODIMENT

5 The method and the apparatus according to the present invention are intended to form and thermoseal at least one end of a per se known packaging container 1 which, in its final form, is substantially
10 parallelepipedic or brick-shaped. Packages of this or similar type are common for packing different types of products such as, for example, milk or juice, but also for packing highly viscous or semi-solid products, for
15 example puddings or cheese. The packaging containers are typically manufactured from a laminated packaging material which includes layers of fibrous material, e.g. paper, as well as thermoplastic and aluminium foil (Alifoil). The thermoplastic layers preferably surround the fibrous layer and
20 cater for the liquid-tightness properties of the packaging container. Moreover, the thermoplastic makes it possible to thermoseal packaging material to itself or to other thermoplastic materials. The Alifoil ensures the material's gas barrier and light barrier properties and also makes possible inductive heating of the laminate, e.g. in connection with sealing.

25 Fig. 1A shows the upper portion of a packaging container blank 2 which is manufactured from a packaging laminate which is of the previously described type, which is provided with a crease line pattern, and which includes four pairwise parallel side wall panels 3 and also end wall panels 4 located at their upper and lower ends. Only the end wall panel 4 located at
30 the upper end at the packaging container blank 2 is visible in Fig. 1, but it is assumed that the opposing, lower end of the packaging container 1 may be of the same type as the upper end, or be designed in any other optional previously known manner. The end wall panels 4 include, on the one hand, two opposing, rectangular end wall panels 4' (main panels), and on the other
35 hand substantially triangular end wall panels 4" (folding panels) located between them. At the upper end of the end wall panel 4 facing away from the side wall panels 3, there is a sealing panel 5 extending around the circumference of the packaging container blank 2. When the packaging container 1 is ready-formed, i.e. when the end wall panels 4 and sealing panels 5 of the packaging container blank 2 have been folded together for the formation of a substantially planar end wall, the two substantially

rectangular main panels 4' together form the actual end wall surface over which the mutually sealed sealing panels 5 extend as a transverse sealing fin 6. The triangular folding panels 4" are folded together to flat-laid, substantially triangular corner flaps 7 which have been folded down and connected to two opposing side wall panels 3. The end portions of the sealing fin 6 extend over the downwardly folded corner flaps 7.

Figs. 1B and 1C show the progressive reforming of the packaging container blank 2 into a finished packaging container 1. In Fig. 1B, the reforming operation has been commenced in that the downward folding of the end wall panels 4 has begun and the sealing panels 5 have been brought closer to one another. In Fig. 1C, the sealing panels 5 are in contact with one another and can be sealed together for the formation of the sealing fin 6, at the same time as the triangular end wall panels 4" have been united for the formation of the opposingly located, flat-laid corner flaps 7 which, however, have not yet been folded down and sealed to the side wall panels 3 of the packaging container 1.

The method and the apparatus according to the present invention are intended to cater for the above-described, per se known reforming and sealing of the end wall of the packaging container blank 2 (Figs. 1A - 1C) in a continuous and rational manner. In order to carry this into effect, use is made of the apparatus illustrated in Fig. 2, which includes a conveyor 8 in the form of a flexible or jointed belt which carries a number of sequentially disposed cassettes 9 for accommodating the packaging container blanks 2. The cassettes 9 may be of any optional configuration, but preferably are of U-shaped cross section and suitably include means (not shown) for fixing the packaging container blank 2 in the desired axial position in the cassette 9. In this position, at least the one (lower) end portion of the packaging container blank 2 will extend outside the lower defining surface of the cassette 9, i.e. the end wall panels 4 and the sealing panels 5 will be accessible for processing outside the lower end of the cassette 9. The conveyor 8 moves continuously and preferably at uniform speed from left to right in Fig. 2, the cassettes passing in sequence a preforming assembly 10 for preforming the one end portion of the packaging container blank 2, a forming station 11 for progressively reforming the end portion of the packaging container blank 2 and uniting together the sealing panels 5 into the fin 6, as well as a sealing station 12 for liquid-tight sealing together of the end wall. The sealing station

12 includes, in sequence, a sealing device 13 for the inductive heating of the laminate layers included in the sealing fin 6, a pressure device 14 for compressing and sealing together the sealing panels 5 included in the fin 6, and a support device 15 for maintaining compression pressure on the fin 6 until such time as the sealing operating has been completed. Each one of these stations included in the apparatus according to the present invention will now be described in greater detail.

Like other parts of the apparatus, the various processing stations are carried in a per se known manner by a frame (not shown) which also supports the remaining machine parts which are not illustrated in the Drawings but are conventional, such as electric motors, drive shafts, belts and other mechanical or electric units. The processing stations are disposed linearly after one another along a straight section of the conveyor 8 which, with the aid of the cassettes 9, continuously displaces the packaging container blanks 2 from left to right in Fig. 2. The lower end surface of the cassettes 9 is located a few millimetres' distance above the adjacent parts of the stations. By guiding the cassettes in this manner past the different stations, the end wall panels 4 and sealing panels 5 projecting out of the lower parts of the cassettes will be in contact with the different processing parts of the forming stations and can, as a result, during progressive displacement through the stations, be reformed into a packaging container end wall of the desired final form (Fig. 1C).

The preforming assembly 10 is first in the row of processing stations seen in the direction of movement of the conveyor 8. The preforming assembly 10 is, like the other processing stations included in the apparatus according to the present invention, fixedly connected to and carried by a frame (not shown). The preforming assembly 10 includes rotary squeezers 16 which are located in register with one another and symmetrically in relation to the conveyor 8, as well as being carried by drive shafts 17, 18. The drive shafts 17 and 18 are supported by journals 19 of conventional type which are fixedly connected to the frame (not shown). The drive shafts 17 and 18 further each carry their belt pulley 20 which, by means of a belt (not shown), is connectable to one or more prime movers of known type. In such instance, the squeezers 16 may be rotated via the belt pulleys 20 in opposite directions, i.e. such that the registering parts of the squeezers 16 move substantially in the same direction as the conveyor 8. Each squeezer 16 is in the form of a

cross through which the drive shaft 17, 18 extends in the centre of the cross. The ends of the arms of the cross display gently curved work surfaces 21 which coincide with an imaginary circle extending around each squeezer 16 and whose diameter coincides with the distance between two opposing work surfaces 21. The distance between the two squeezers 16, i.e. the distance between the temporarily mutually facing work surfaces 21, is less than the distance between two opposing main end panels 4' when these are located in a plane with adjacent side wall panels 3 (Fig. 1A). An imaginary centre line for the various processing stations further extends centrally between the above-mentioned opposing work surfaces 21 on the two squeezers 16, as is apparent from Fig. 3.

After the preforming assembly 10, there follows the forming station 11 which includes a forming device 22 extending along the conveyor 8. More precisely, the forming device 22 includes two mutually parallel folding rails 23 each with their work surface 24 whose orientation varies along the length of the forming device 22. As will be apparent from Figs. 4A-E, which show repeated cross sections distributed uniformly over the length of the folding rails 23, the work surfaces 24 at the intake end of the folding rails 23, i.e. the end located most proximal the preforming assembly 10, are substantially parallel with the longitudinal axis of a packaging container 1 advanced by the conveyor 8. In other words, the work surfaces 24 are parallel with one another and are disposed mutually spaced apart a distance which substantially corresponds with the distance between the mutually facing work surfaces 21 on the squeezers 16. Seen in the direction of movement of the cassettes 9, the inclination of the work surfaces 24 thereafter progressively changes so that, midway along the folding rails, these are located substantially at an angle of 45° to the above-mentioned plane (Fig. 4C). At the final end of the folding rails, i.e. at the end facing towards the subsequent sealing station 12, the work surfaces 24 are located in a common horizontal plane (Fig. 4E) which is located immediately adjacent (1-2 mm) the lower surface of the cassettes. Between the two folding rails, there now remains only an interspace which is equal to or slightly exceeds the total thickness of the wall portions included in the sealing fin 6.

A distance after the forming device 22 of the forming station 11, there is disposed the sealing device 13 of the sealing station 12. This is also disposed linearly in relation to the remaining sealing stations and the

conveyor 8. The sealing device 13 includes two inductors 25 disposed on either side of the centre of the conveyor 8 and fixedly connected to the frame (not shown), being mutually mirror-reversed and also disposed a distance from each other (Fig. 5). As will be apparent from the cross section through parts of the two inductors 25 illustrated in Fig. 5, each inductor includes a coil (not shown) with two parallel conductors 26, as well coolant ducts 27 located behind them. The conductors are, in a conventional manner, connectable to a current source (not shown), and are intended for induction heating of the layer of aluminium foil located in the sealing panels 5 of the packaging container blank 2. The distance between the two work surfaces 28 of the inductors 25 facing towards one another is slightly greater than the total thickness of the sealing panels 5 included in the sealing fin 6, which ensures that inductive heating of the sealing fin can actually take place. This technique is per se well known in the art and is not likely to need any detailed description in this context.

The sealing station 12 also includes a pressure device 14 disposed after the sealing device 13, the pressure device 14 displaying two cooperating pressure rollers 29 and 30. The pressure rollers 29 and 30 are driven, like support rollers 31 located in subsequent support devices 15, by means of a cogged belt 32 which, by the intermediary of a belt pulley 33 and a drive shaft 34, are connectable to a per se known electric drive motor (not shown). The pressure rollers 29 and 30 are supported by mutually parallel shafts which are similarly parallel with the longitudinal axis of the packaging container blank 2 located in the cassettes 9. As will be apparent from Fig. 7, the one pressure roller 29 (which is manufactured from a hard material, such as stainless steel) includes a projecting flange or ridge 35 which is located one or a few millimetres higher than the surrounding cylindrical work surface of the pressure roller 29. The cooperating pressure roller 30 is cylindrical throughout its entire height but displays a surface layer 36 of flexible material forming its work surface, e.g. rubber. The distance between the work surface of the pressure roller 29 and the surface layer 36 consisting of rubber on the pressure roller 30 is substantially equal to or slightly less than the total thickness of the sealing panels 5 included in the sealing fin 6. The distance between the part of the work surface of the pressure roller 29 which is carried by the flange 35 and the flexible surface layer 36 on the pressure roller 30 is considerably less and amounts to

substantially only approximately 1 mm. Like, for example, the squeezers 16, the two pressure rollers 29 and 30 are driven in opposite directions of rotation, i.e. so that their temporarily mutually facing parts of the work surface move in the same direction as the cassettes 9 conveyed by means of the conveyor 8 past the pressure rollers 29 and 30.

After the pressure device 14, seen in the direction of movement of the conveyor 8, the sealing station 12 displays the support device 15 with the previously mentioned support rollers 31 which are disposed in two parallel rows along the path of movement of the conveyor 8. The support rollers 31 are carried by mutually parallel shafts (not shown) which are freely rotatably journaled in two mutually parallel reel holders 37 located adjacent one another. At the opposite side of the reel holders which is not visible, the shafts of the support rollers 31 display belt pulleys which, with the aid of the previously mentioned cogged belt 32, may be driven in opposite directions so that the work surfaces of the support rollers 31 facing towards one another move in the direction of movement of the conveyor 8. The distance between the work surfaces of the support rollers 31 included in the two rows is slightly less than the total thickness of the sealing fins 6 of the packaging containers. The support rollers 31 are manufactured from, or display a surface layer of a relatively flexible material, e.g. rubber.

As will have been apparent from the foregoing description, the apparatus according to the present invention includes a number of processing stations disposed in line with each other which, on operation of the apparatus, sequentially act on end portions of the packaging container blanks 2 projecting from the cassettes 9. More precisely, in accordance with the method according to the present invention, a packaging container blank 2 which is carried by any optional cassette 9 will, in its one end portion, be reformed from the appearance illustrated in Fig. 1A to the appearance illustrated in Fig. 1C, i.e. the end portion of the packaging container blank is closed and sealed in liquid-tight fashion in the sealing fin 6. When one end of a packaging container is to be formed and thermosealed in accordance with the present invention, a packaging container blank 2 is, as was previously mentioned, first placed in one of the cassettes 9 of the conveyor 8. In such instance, the packaging container blank 2 is oriented such that its one end projects outside the lower end region of the cassette 9. More precisely, the end portion extends substantially along the side wall panels 3, which implies

that the end wall panels 4 and sealing panels 5 extend down beneath the cassette 9 and will be freely accessible for processing when the relevant cassette is displaced with the aid of the conveyor 8 from left to right in Fig. 2. In such instance, the packaging container blank 2 first arrives at the preforming assembly 10 which rotates at substantially the same peripheral speed as the linear speed of the conveyor 8. The two mutually cooperating work surfaces 21 will then, on rotation of the squeezers 16, come into contact with a front portion of the opposing main end panels 4' of the packaging container blank 2 which, because of the distance between the two work surfaces 21 will, in such instance, be actuated in a direction towards one another. More precisely, the two main end panels 4' will be folded towards one another around a substantially horizontal fold line located between the main end panels 4' and adjacent side wall panels 3. At the same time, the triangular folding panels 4" will be forced outwards so that the sealing panels 5' bordering on the two main end panels 4" can approach one another, as is illustrated in Fig. 1B,

When the packaging container blank 2, with the aid of the preforming assembly 10, has been reformed in the above-described manner, the projecting end portion is, on the continued displacement of the conveyor 8, led in between the two folding rails 23 of the forming device 22, whereupon the mutually parallel work surfaces 24 of the folding rails come into contact with the main end panels 4' at their upper edge regions adjacent the sealing panels 5. The progressively changing inclination of the work surface 24 of the folding rails 23 here entails a progressive converging of the main end panels 4' until such time as the sealing panels 5 abut against one another and together form the sealing fin 6. The sealing fin 6 is now displaced with the aid of the conveyor 8 further to the sealing station 12 and, more precisely, in between the two inductors 25 of the sealing device 13 which have been activated in that the conductors 26 have been connected to the previously mentioned current source (not shown). In such instance, a magnetic alternating current is generated around the conductors 26 which, by cooperation with the layer of aluminium foil included in the packaging laminate, entails an inductive heating of the aluminium foil layer in those parts of the sealing panels 5 which are to be sealed to one another. When the sealing fin 6 of the relevant packaging container 1 has passed along the entire length of the inductors 25, the heating of the aluminium foil has

resulted in adjacent parts of the thermoplastic layers of the packaging laminate being heated to sealing temperature (in, e.g. polypropylene approximately 160-170°C) so that a thermosealing of the thermoplastic layers included in the sealing panel 5 to each other is made possible.

5 The packaging container 1 is thereafter moved from the sealing device 13 to the pressure device 14 where, more precisely, the projecting sealing fin 6 (now heated to sealing temperature) runs in between the two mutually cooperating pressure rollers 29, 30. The sealing panels 5 included in the sealing fin 6 are now compressed against one another so that the heated
10 thermoplastic layers at the inside of the packaging container are caused to fuse together. A particularly concentrated compression takes place with the aid of the flange 35 of the pressure roller 29, which further reduces the free distance between the work surfaces of the pressure rollers 29 and 30. The force of this compression is regulated by a suitable selection of the flexible
15 surface layer 36 on the compression roller 30. In such instance, it will be ensured that a liquid-tight, well-compacted seal is obtained along the part of the sealing fin 6 facing towards adjacent main end panels 4', which guarantees a liquid-tight seal. After the sealing-together, the contact pressure is maintained between the now mutually united thermoplastic layers facing
20 towards one another at the inside of the sealing fin 6 with the aid of the support rollers 31 which, during the continued transport of the relevant packaging container 1, surround the sealing fin 6 and ensure that the sealing panels 5 included in this fin continue to be urged against one another at suitable abutment pressure until such time as the heated thermoplastic
25 layers have once again cooled and the seal is completed. In such instance, the mutual cooperating rotation of the support rollers 31 contributes in the as yet still warm sealing fin 6 being subjected to uniform compression and advancement without the sealing panels 5 included in the sealing fin 6 being exposed to any mutual movement which would weaken the resultant seal.
30 When the sealing fin 6 has passed the support rollers 31, the cooling of the sealing fin 6 has continued for such a length of time that the mutually interconnected thermoplastic layers have once again hardened and thereby formed the desired, liquid-tight and strong bonding of the sealing panels 5 included in the fin 6. After discharge from the support rollers 31 of the
35 support device 15, an additional forming processing of the packaging container 1 takes place in a per se known manner in order to fold down the

flat-laid corner flaps 7 with associated parts of the sealing fin 6 and to seal these to the outside of the packaging container. However, this is a per se known technique and forms no germane part of the present invention.

5 With the aid of the method and the apparatus according to the present invention, it will thus be possible, during continuous displacement of the packaging container blanks 2, to realise a forming and thermosealing of the one or both of the end portions of the packaging container 1. This makes for a considerably increased working speed compared with prior art similar machines which normally operate with stepwise advancement of one or
10 more packaging containers. The design and construction according to the present invention are also considerably simpler and thereby both more economical and more reliable, since they include but few moving parts and moreover totally lack moving parts executing a reciprocating movement.

WHAT IS CLAIMED IS:

1. A method of forming and thermosealing one end of a packaging container comprising layers of thermosealable material, the packaging container being displaced by means of a conveyor through a forming station and a sealing station, characterized in that the conveyor (8) displaces the packaging container (1) through the forming station (11) in contact with mechanical forming devices (22) which progressively reform the packaging container end until such time as opposing walls thereof meet one another in a sealing fin (6) oriented in the direction of movement of the packaging container, whereafter the conveyor (8) further displaces the packaging container end in between sealing devices (13) disposed in the sealing station (12) which heat thermoplastic material located in the sealing fin (6) to sealing temperature, whereafter wall portions included in the sealing fin are mechanically urged against one another during simultaneous cooling and continued advancement.
2. The method as claimed in Claim 1, characterized in that the advancement of the packaging container (1) takes place continuously and at uniform speed through the processing stations.
3. An apparatus for forming and thermosealing one end of a packaging container (1) which is displaced by means of a conveyor (8) through a forming station (11) and a sealing station (12), characterized in that the forming station (11) includes a mechanical forming device (22) which is disposed along the conveyor (8) a distance therefrom, as well as sealing devices (13) disposed in the sealing station (12), the sealing devices similarly extending along the conveyor (8) a distance therefrom and being disposed to heat a sealing region of the packaging container (1), and also compression devices (14) disposed after the sealing devices and disposed to mechanically compress the heated wall portions so that these, after cooling, are sealed to one another in liquid-tight fashion.
4. The apparatus as claimed in Claim 3, characterized in that the forming device (22) includes a folding rail (23) extending along the conveyor (8), with a work surface (24) which, seen in the direction of movement of the

conveyor, is commenced in a first orientation and terminated in a second orientation which differs 90° from said first orientation.

5 5. The apparatus as claimed in Claim 4, characterized in that the first
orientation is parallel with the longitudinal axis of a packaging container (1)
advanced by the conveyor (8).

10 6. The apparatus as claimed in Claim 4 or 5, characterized in that it
includes two folding rails (23) provided with counter-facing work surfaces
(24) which, at their final end, display a mutual interspacing which is equal to
or slightly exceeds the total thickness of the wall portions included in the
sealing fin (6) of the packaging container.

15 7. The apparatus as claimed in any one or more of Claims 3 to 6,
characterized in that the sealing device (13) includes an inductor (25) for
inducing a heating magnetic field in a layer of conductive material included
in the laminate.

20 8. The apparatus as claimed in Claim 7, characterized in that an
inductor (25) is located at each side of the path of movement of an end
portion of a packaging container (1) advanced by means of the conveyor (8).

25 9. The apparatus as claimed in any one or more of Claims 4 to 8,
characterized in that a mechanical preforming assembly (10) is disposed
ahead of the forming device (22) seen in the direction of movement of the
conveyor.

30 10. The apparatus as claimed in Claim 9, characterized in that the
preforming assembly (10) includes two counter-rotating squeezers (16)
disposed on either side of the conveyor (8) with peripheral mutually facing
work surfaces (21) which are driven in the direction of movement of the
conveyor (8) and at the same speed as the conveyor.

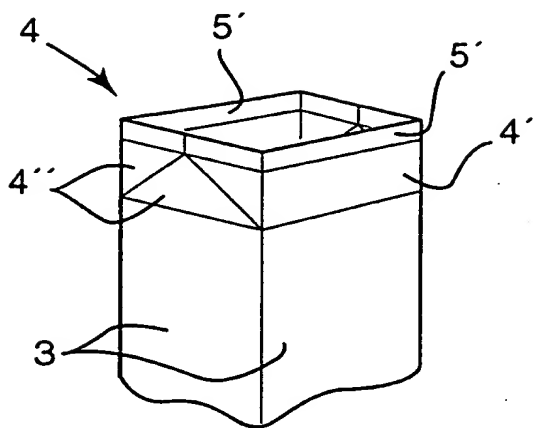


Fig 1A

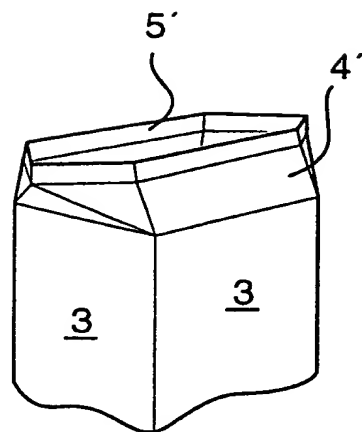


Fig 1B

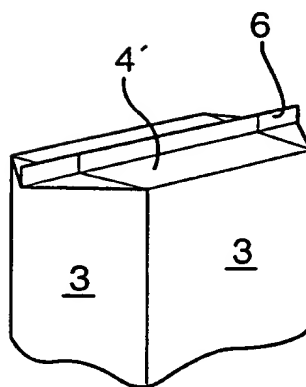


Fig 1C

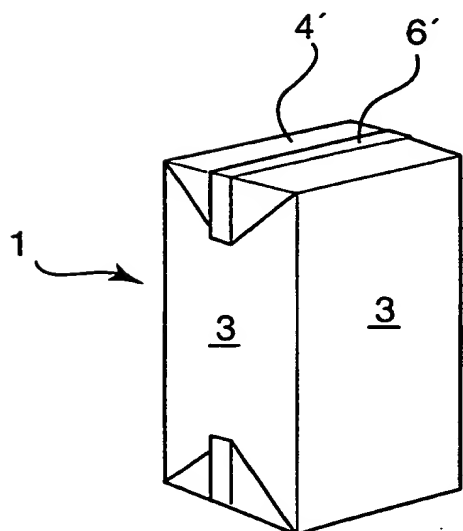
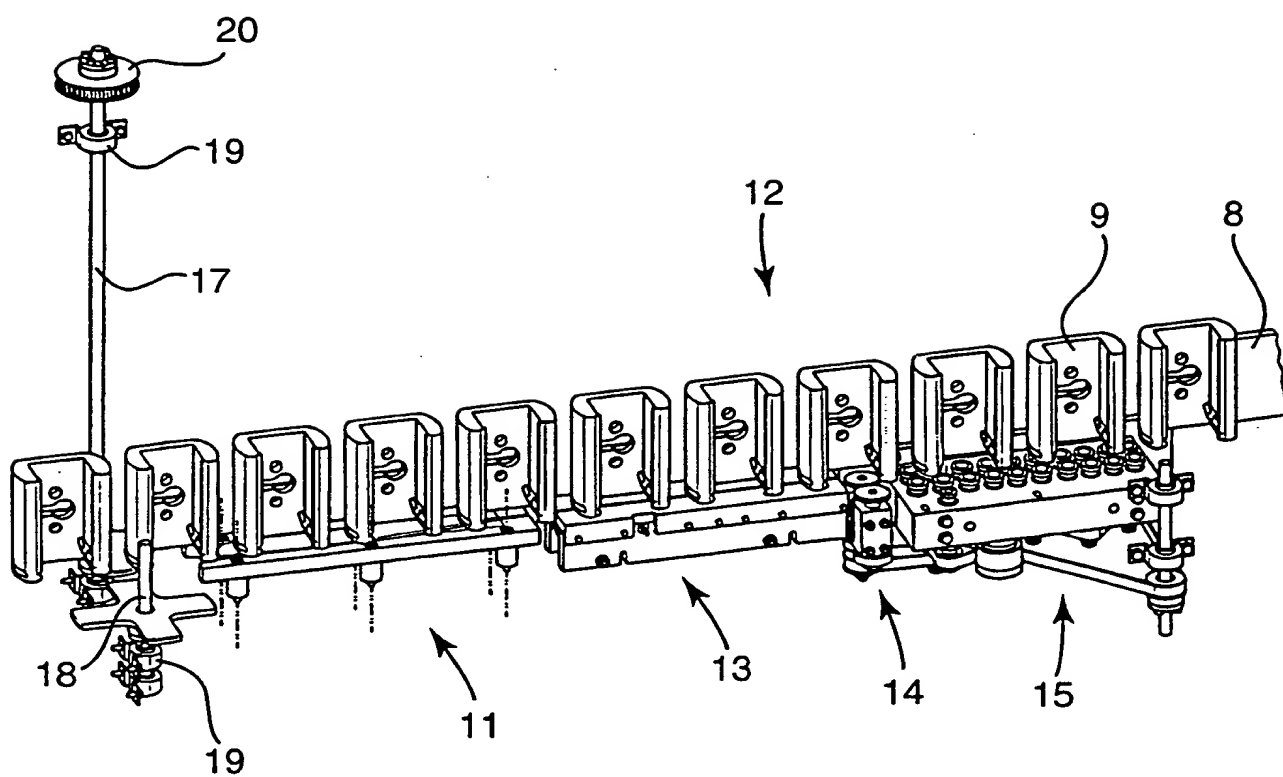
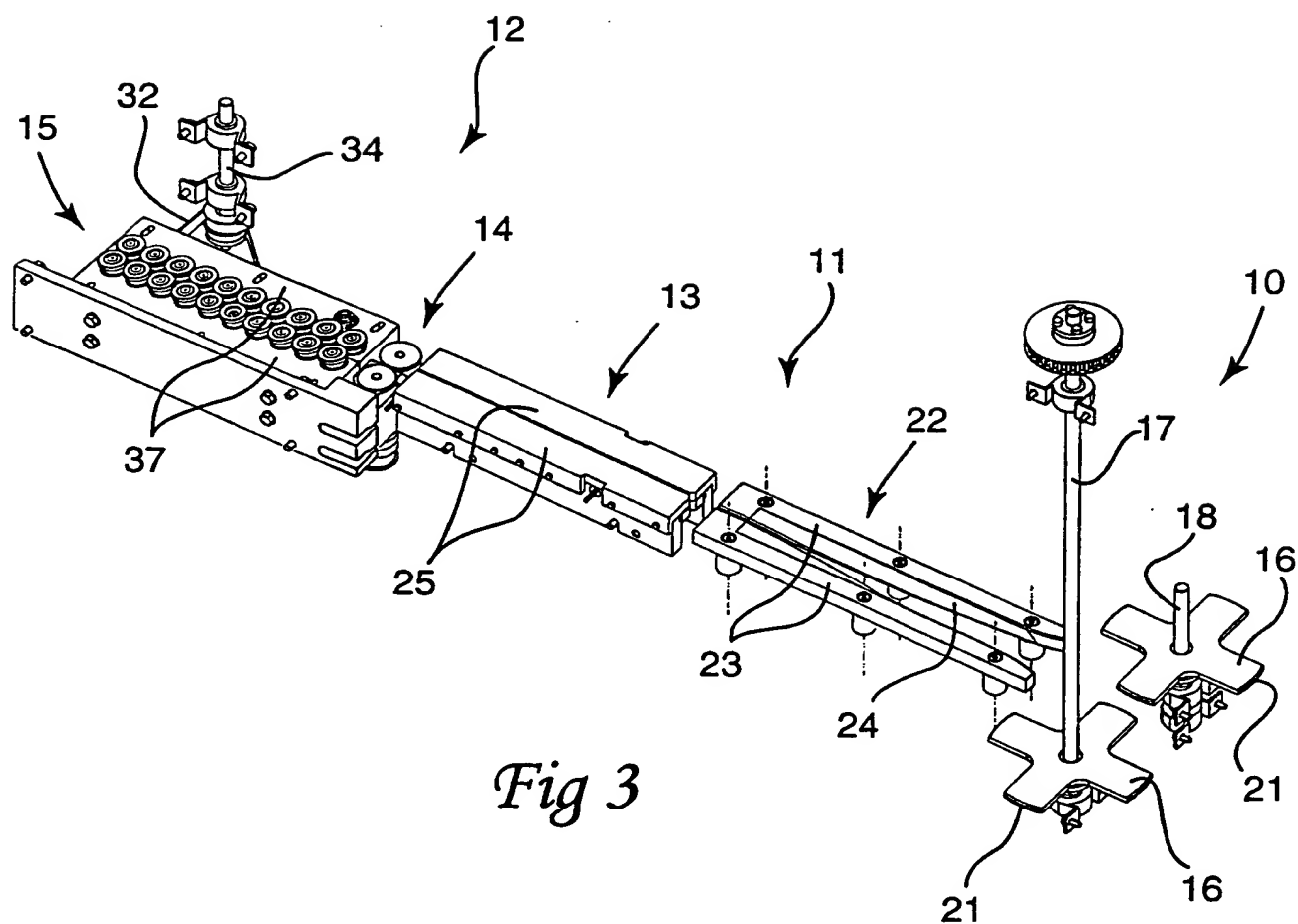


Fig 1D





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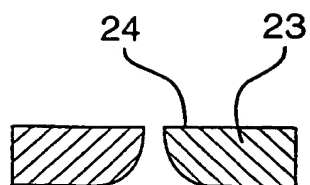


Fig 4E

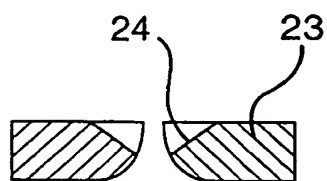


Fig 4D

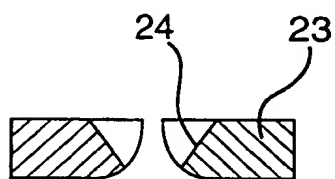


Fig 4C

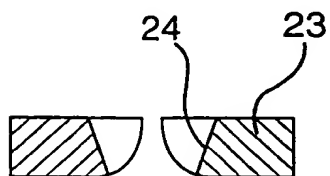


Fig 4B

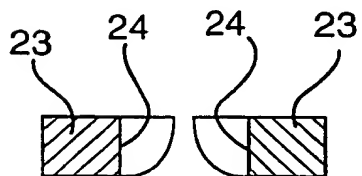


Fig 4A

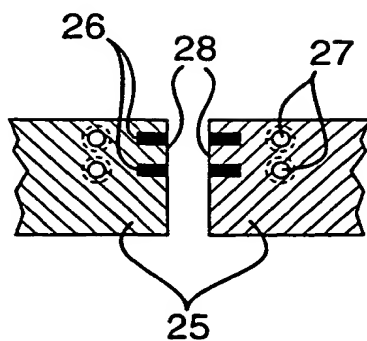
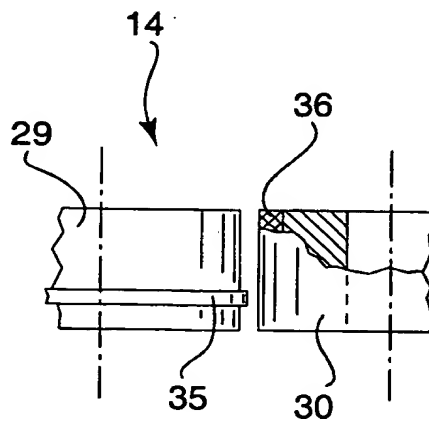
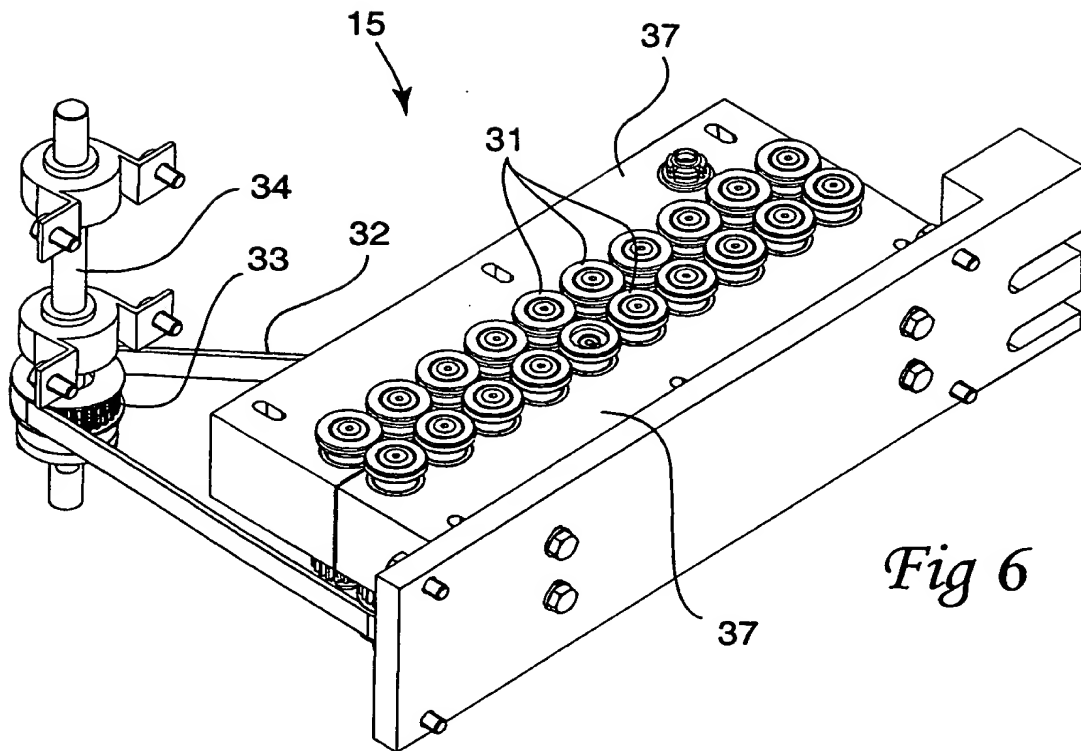


Fig 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/00163

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B65B 7/20, B65B 3/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2979995 A (F.D. BERGSTEIN ET AL), 18 April 1961 (18.04.61), column 3, line 31 - line 35; column 3, line 52 - line 62, figures 1-3 --	1-3,7,8
X	US 3120089 A (C.Z. MONROE ET AL), 4 February 1964 (04.02.64), column 5, line 19 - line 31; column 14, line 43 - line 47; column 15, line 38 - line 52 --	1-3
A		4-8
X	SE 390716 B (HERCULES INCORPORATED), 17 January 1977 (17.01.77), page 7, line 4 - line 14; page 19, line 21 - line 35 --	1-3
A		4-6

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

26 April 2000

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/00163

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4473989 A (TSUTSUMI ET AL), 2 October 1984 (02.10.84), column 11, line 19 - line 44 --	1-10
A	US 3861123 A (EBURN, JR. ET AL), 21 January 1975 (21.01.75), column 5, line 54 - line 62; column 6, line 14 - line 19, figures 4,5a-5f -- -----	4-6

INTERNATIONAL SEARCH REPORT
Information on patent family members

02/12/99

International application No.
PCT/SE 00/00163

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
US	2979995	A	18/04/61	NONE	
US	3120089	A	04/02/64	NONE	
SE	390716	B	17/01/77	CA 927269 A DE 2100426 A,C FR 2075260 A GB 1304471 A JP 51014950 B NL 156978 B NL 7100023 A US 3699743 A	29/05/73 15/07/71 08/10/71 24/01/73 13/05/76 15/06/78 09/07/71 24/10/72
US	4473989	A	02/10/84	CA 1179996 A GB 2085835 A,B JP 57204802 A JP 57210104 A JP 1212815 C JP 57077417 A JP 58048414 B	25/12/84 06/05/82 15/12/82 23/12/82 27/06/84 14/05/82 28/10/83
US	3861123	A	21/01/75	NONE	